175 Series
Electrical Actuator

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1 INTRODUCTION

GAC's 175 Series Integrated Pump Mounted Actuators are field proven proportional actuators designed to mount directly to fuel injection pumps in place of a mechanical governor to achieve an integrated proportional servo fuel package. The versatile design offers numerous options and mounting kits. Its fast response time of less than 35 ms (10 % - 90 %) also offers adjustable fuel limits.

Built with sealed components and no sliding parts, the design demonstrates outstanding reliability with no maintenance required. The 175 series supports Bosch-style "P" pump and BYC ASIMCO pumps designs.

- ◊ Connects directly to fuel rack in place of mechanical governor
- ◊ Available with digital governors
- ◊ Manual shut-off mechanism
- ◊ Fast response; < 35 ms (10–90 %)
- ◊ Right-hand rack

2 SELECTION CHART

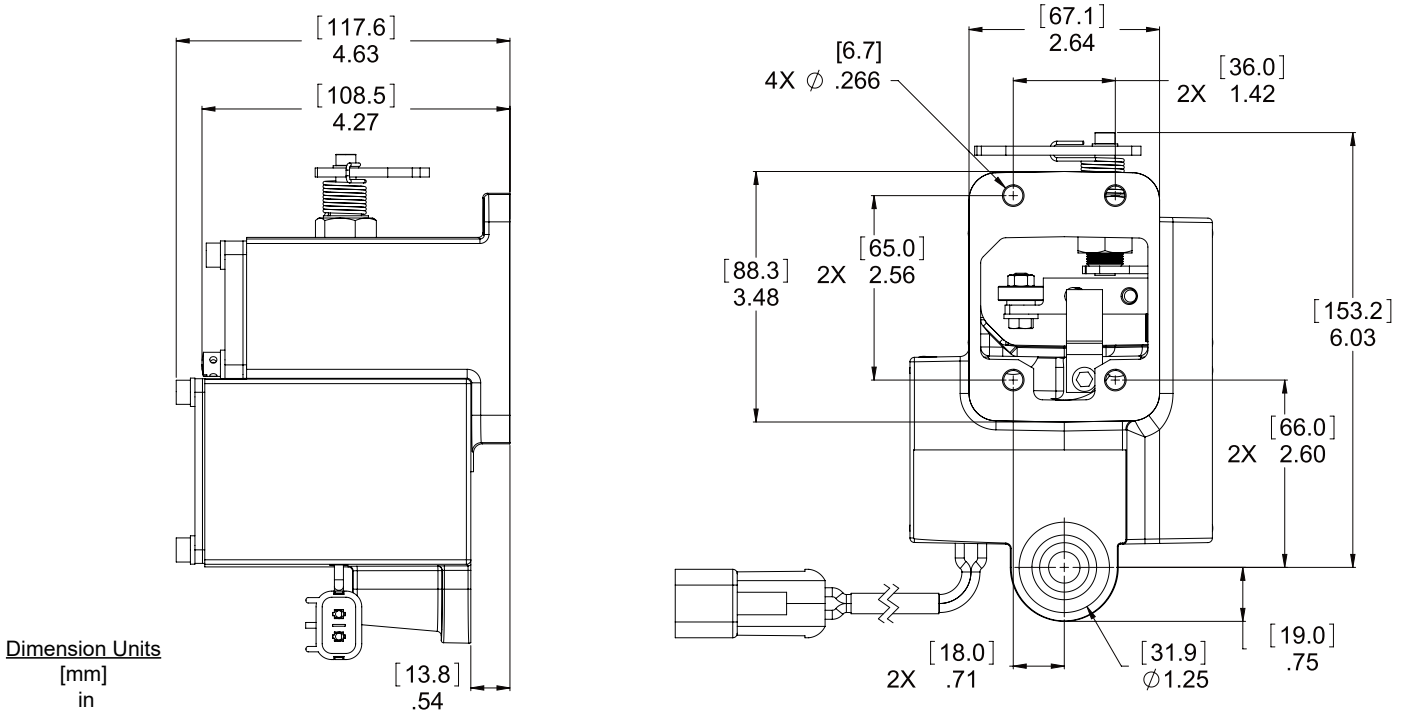
PART NUMBER	DESCRIPTION	12 VOLT	24 VOLT	MANUAL SHUTOFF	FEED-BACK SENSOR	BYC COMPATIBLE
ACD175A-12	12VDC / Packard Connector without Mating Connector / Double Rack Bearing / BYC ASIMCO KT283 Included	■				■
ACD175A-24	24VDC / Packard Connector without Mating Connector / Double Rack Bearing / BYC ASIMCO KT283 Included		■			■
ADD175A-12	12VDC / Packard Connector without Mating Connector / Single / Bosch Install Kit KT289 Included	■		■		
ADD175A-24	24VDC / Packard Connector without Mating Connector / Single (ADD) / Bosch Install Kit KT289 Included		■	■		
ADD175F-12	12VDC / Packard Connector without Mating Connector / Single Rack Bearing / Bosch Install Kit KT289 Included / Novotechnik Position Feedback Sensor (Mating Connector EC1523 Not Included)	■			■	
ADD175F-24	24VDC / Packard Connector without Mating Connector / Single Rack Bearing / Bosch Install Kit KT289 Included / Novotechnik Position Feedback Sensor (Mating Connector EC1523 Not Included)		■		■	

3 SPECIFICATIONS

PERFORMANCE	
Force	6.2 lbf·ft (27.5 N m)
Operating Stroke	0.80 in (21 mm)
Response Time (10-90%, 2-19 mm)	35 ms
Internal Sealing Pressure	2 bar (29 psi)
ELECTRICAL POWER INPUT \ OUTPUT	
Operating Voltage	12 V DC or 24 V DC
Nominal Operating Current	4.0 A (12 V DC) 2.0 A (24 V DC)
MAX Continuous Current	5.8 A (12 V DC) 3.1 A (24 VDC)
Nominal Coil Resistance	7.2 Ω (12 V) 2.0 Ω (24 V)
Internal Sealing Pressure	2 bar (29 psi)

ENVIRONMENTAL	
Operating Temperature	-40°F to 200 °F (-40°C to 95 °C)
Relative Humidity	Up to 100 %
Vibration	20 g @ 20 to 500Hz
Shock	20 g @ 11 ms
All Surface Finishes	Fungus Proof and Corrosion Resistant
PHYSICAL	
Dimensions	Approx 4.25 in x 4.63 in x 6.77 in [106.0 mm x 117.6 mm x 171.9 mm] See Section 4, Installation
Weight	4.75 lbf (2.2 kgf)

4 DIMENSIONS



5 INSTALLATION KITS

The following mounting kits are available in addition to those included with the actuator. See your GAC representative for details.

MOUNTING - ADAPTER KITS			Included with Actuators
PART NUMBER	PUMP TYPE	DESCRIPTION	
KT283	BYC 'P' Pump	175 Series Installation Kit - Spare (Included with Actuator) - Hardware, Gasket, Shutoff Plate, Spring, Retainer, Linkage	
KT153	Motorpal Mi	175 Series Installation Kit - Motorpal Mi Series - PPxM10P1i Fuel Injection Pumps - Plate, Linkage, and Mounting Hardware [Note - same as KT188-2]	
KT175-RS-R	Bosch RS/RSV	175 Series Adapter Kit - For Bosch RS/RSV Governor / Right Hand Rack / Mounts Actuator Directly to Intermediary Mechanical Governor Housing - Adapter Plate, Linkage, Gasket, Hardware	
KT175-RS-R-ZEXEL	Zexel RS/RSV	175 Series Installation Kit - For Zexel RS/RSV Governor / Right Hand Rack / Mounts Actuator Directly to Intermediary Mechanical Governor Housing - Adapter Plate, Linkage, Gaskets (Governor Housing and Actuator), Hardware	
KT175A-R	Bosch A Pump	175 Series Installation Kit - Bosch A Pump / Right Hand Rack - Includes Adapter Plate, Bearing Retainer (KT176A), Spring, Gaskets, Linkage, Hardware	
KT197	Bosch EDC	175 Series Installation Kit - Bosch EDC Governor - Mounting Plate, Linkage, Gasket, Hardware	
KT289		175 Series Installation Kit - Spare (Included with Actuator) - Hardware, Gasket, Shutoff Plate, Spring, Retainer, Linkage [Note - KT289 includes all of KT283]	
KT-BYC	BYC 'P' Pump	175 Series Installation Kit - BYC ASIMCO Pumps - A, AD, P, P7100, PB197 - Adapter Plate, Gasket and Seal	

Item	Part Number
Actuator Mating Connector	EC1300
Actuator Mating Cable Harness (6 ft.)	CH1215

NOTE The difference between the KT283 and KT289 is that KT283 is missing two components, which are included with the fuel pump.

6 INSTALLATION PREPARATION

- An overspeed shutdown device, independent of the governor system, should be used to prevent loss of engine control which may cause personal injury or equipment damage.
- Do not rely exclusively on the governor system electric actuator to prevent overspeed. A secondary shutoff device, such as a fuel solenoid must be used.

Before installing the actuator:

- Ensure paint or other debris does not enter the main shaft bore.
- The standard connection is one bearing rolling on link piece provided in KT289. Two bearings are sometimes needed to accommodate height variances across different fuel pump models. The lever assembly on ADD175SA-24 is designed to work with specially modified rack and linkage, consult GAC for details.
- OEM part number may be on Lovol brand engines.
- Select models have GAC logo embossed on top cover. On some models, lock washers are used in place of flat washers to tighten down the covers. Contact GAC if special accommodation is needed

If the fuel injection pump is equipped with a mechanical governor, it must be removed.

NOTE: GAC recommends that this modification be performed by a qualified fuel injection service facility.

The following steps are generally required to remove an existing mechanical governor:

1. Remove the rear housing from the mechanical governor and disconnect the governor linkage from the pump fuel rack. Remove the flyweight assembly. A special tool is required.
2. Remove the intermediate governor housing. This leaves only the rack and camshaft protruding from the pump.
3. Install the appropriate adapter plate to provide the transition required from the actuator to the mounting holes formerly held by the governor housing. This plate must have countersunk holes for the mounting screws.

7 WIRING

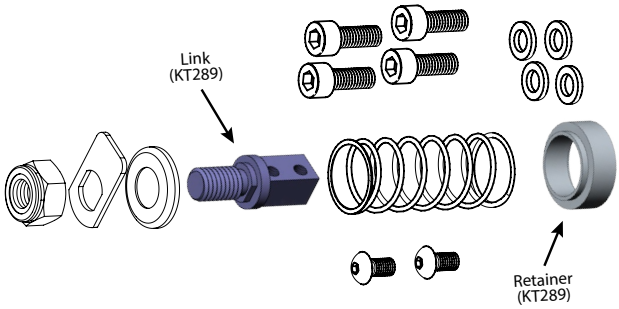
The 175 Series Integral Electric Actuator is prewired for 12 or 24VDC operation. Use the included cable harness or make up a cable harness to connect the actuator to the speed control unit.

Do not use the 175 Series actuator on a 32-volt system. Contact the GAC for any further assistance.

8 MOUNTING KITS

KT283 is specific to the BYC (ASIMCO) fuel injection pump where the retainer and link are included with the fuel pump.

KT289 comes with the retainer and link, giving the customer a choice of whether or not to use the two included components.

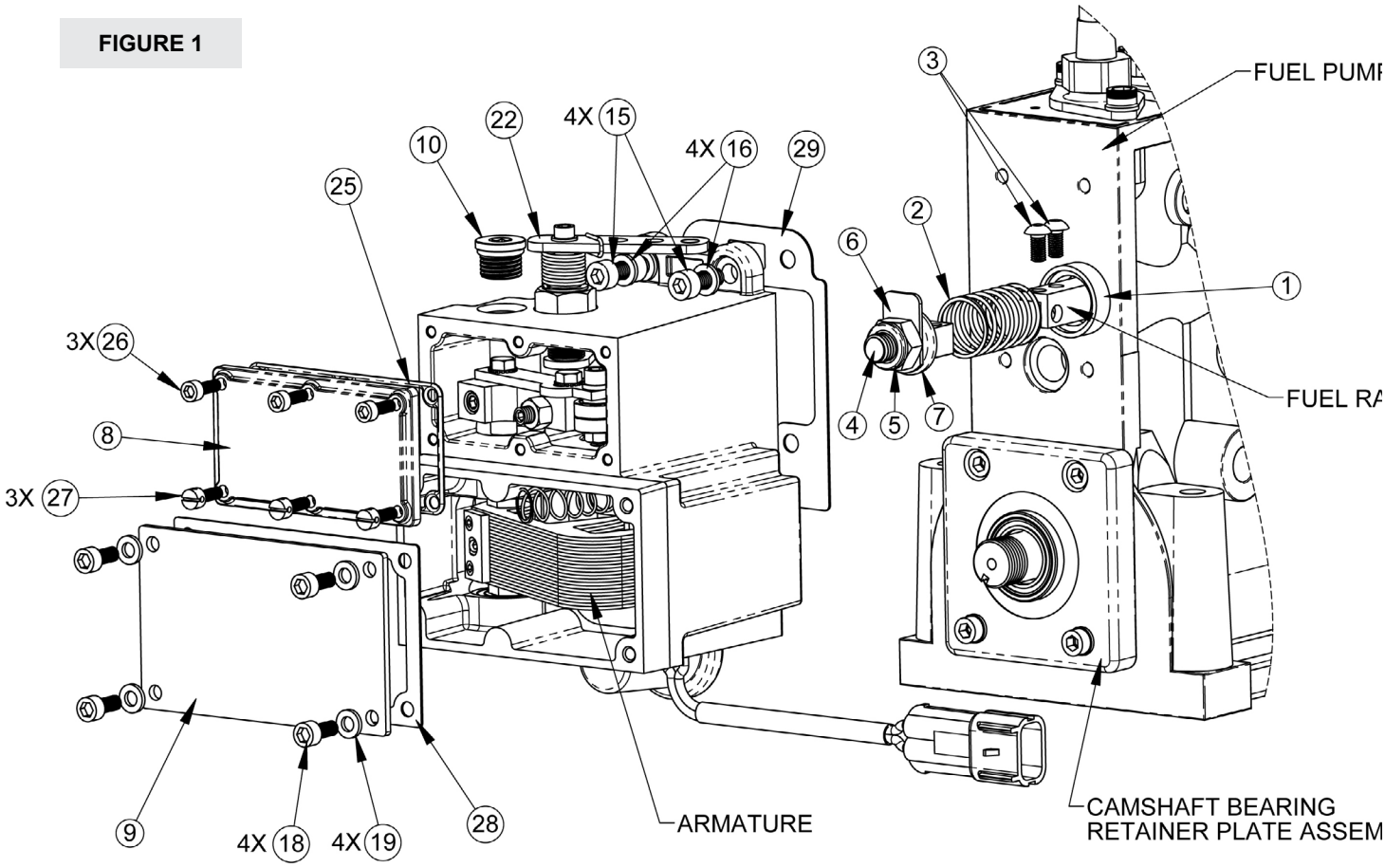


9 INSTALLING THE ACTUATOR

All hardware needed to attach the actuator to the pump is located in either kit KT283 or KT289, which are supplied with their related actuator.

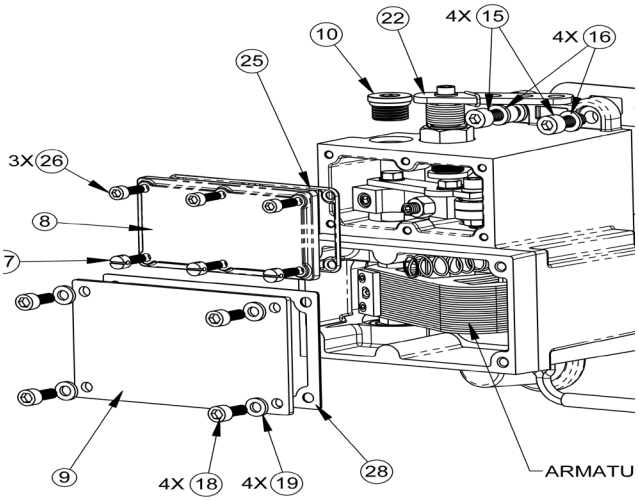
1. Place the spring seat (Figure 1 (1)) over the fuel rack and slide it to the body of the fuel pump. Slide the fuel rack return spring (2) over the fuel rack and against the spring seat.
2. Attach the rack connection link assembly (4, 5, 6, 7) to the fuel rack with two M5 X 10 mm long retaining screws (3) coated with Loctite adhesive. Torque the screws to 3-4 N m.
3. Remove the upper actuator cover (8) and o-ring seal (25). Retain all hardware.
4. Clean the actuator to pump adapter mounting surface so that it is free of any debris.

FIGURE 1



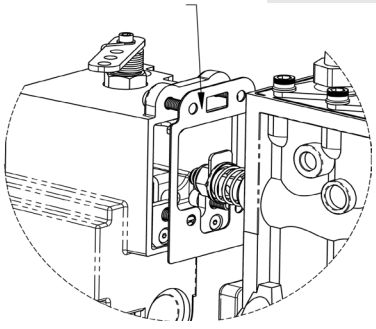
5. Insert two M6 X 16 mm long screws (Figure 2 (15)) and spring washers (16) through the lower mounting holes inside the upper actuator cavity
6. Align the gasket (29) and install it over the two screws. Apply the pressure sensitive adhesive side of the gasket to the actuator mounting face (Figure 3).
7. Carefully slip the actuator over the fuel rack assembly until the two lower screws just start to meet the fuel pump mounting holes.

FIGURE 2



APPLY PRESSURE SENSITIVE ADHESIVE SIDE OF GASKET TO ACTUATOR MOUNTING FACE.

FIGURE 3



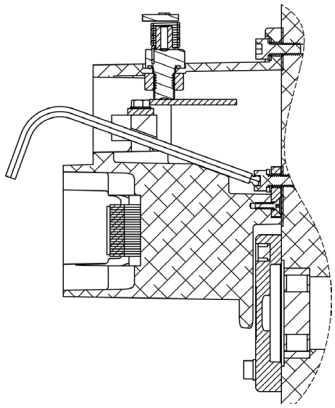
9 INSTALLING THE ACTUATOR (CONTINUED)

IMPORTANT

Alternate tightening diagonally opposite mounting screws so the actuator is aligned properly with the pump adapter plate.

8. To attach the lower mounting screws, insert a ball end hex wrench through the hex key access point (Figures 4 and 5) located on the operating lever and tighten the lower left mounting screw (Figure 6 (17L)) a few turns.
9. Pull the operating lever (Figure 4(37)) outward and slide the ball end hex wrench into the space between the operating lever and the access point in the housing of the actuator and tighten the right lower mounting screw (17R).

FIGURE 5



10. Once these two screws are fully engaged (do not tighten at this time) into the pump housing, insert two additional M6 X 16 mm long screws (Figure 2 (15)) and spring washers (16) into the top two mounting holes of the actuator and thread into the pump housing.
11. Torque all four mounting screws to 5-6 N m.
12. Verify that the fuel rack assembly moves in and out freely inside the upper cavity of the actuator.

FIGURE 4

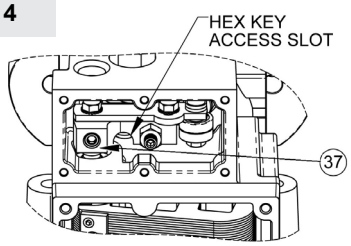
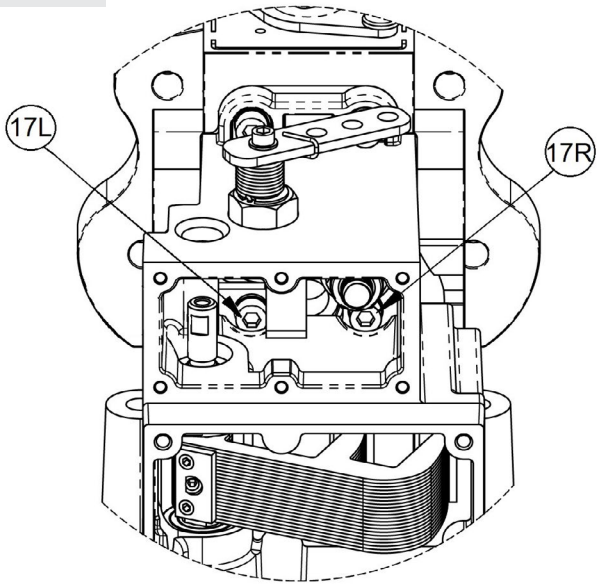


FIGURE 6



Setting high fuel levels may cause the maximum fuel adjusting screw to hit the top cover, which can change the minimum fuel position. This could lead to a dangerous condition. When setting fuel levels above 17 mm, ensure the adjusting screw does not contact the top cover at minimum level. Make sure that the cold start magnet is de-energized when adjusting the actuator with the cold start option.

9 INSTALLING THE ACTUATOR (CONTINUED)

13. Carefully loosen screw (Figure 7(31) and (30)) over the slotted portion of the adjustment plate so that the operating lever bearing assembly (39) can be moved away from the fuel rack connection link.

14. Ensure that the fuel rack is as far out of the pump as possible.

15. Rotate the operating lever (37) out from the actuator until it stops (the armature of the actuator will be in contact with the lower cover (Figure 1 (9)) and hold this position.

16. Rotate the adjustment plate and lever bearing assembly (Figure 7(39)) inward towards the fuel rack so that contact between the bearing and rack connection link is made.

17. Continue to push in an additional 1 to 2 mm, and, while holding this position, torque the operating lever assembly shaft screw (31) and screw (30) to 4-6 N m.

18. Inspect the assembly to ensure all screws are tight and the fuel rack moves smoothly without any binding.

Push in the fuel rack manually to the full fuel position and rotate the fuel shut off lever (Figure 1(22)) to minimum fuel to confirm that the shut off lever contacts the metal plate (Figure 1 (6)) on the fuel rack connector assembly and forces the fuel rack to minimum position.

19. Use the maximum fuel adjustment set screw (Figure 7 (38)) on the operating lever to restrict the fuel rack travel.

20. With the fuel pump operating on the engine, the maximum fuel setting screw can be adjusted to provide specific horsepower. Once this setting is made torque the locknut (24) on the fuel adjustment screw to 5-6 NM.

21. Rotate the manual shut off lever (Figure 1(22)) to the stop position and ensure that the fuel is completely shutoff and the engine stops. With the engine shut down, install the upper chamber cover (8) and o-ring seal (25) by first applying Loctite 222 to each of the six screws (26, 27) provided.

22. Ensure that, when installed, the cover does not hit the internal operating lever or the maximum fuel adjustment screw.

23. Torque the cover screws to 2-3 N m. Check for any oil leaks. Lock-wire the lower screws for tamper resistance.

FIGURE 7